CONCRETE BRIDGE DECK WITH ISOTROPIC REINFORCING

CONSTRUCTION REPORT

USBR Canal Bridge
The Dalles - California Highway
Klamath Falls, Oregon

Experimental Features

by

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Prepared for

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and

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ACKNOWLEDGMENTS

The author would like to thank the following Oregon Department of Transportation (ODOT) personnel for their help in gathering information and guiding this project: Phil Rabb, Richard Steyskal, Jim Bosket, Steve Starkey, John Stucky, Mike Pulzone, Scott Nodes, Ken Paetz, and Kevin Groom.

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CONCRETE BRIDGE DECK WITH ISOTROPIC REINFORCING

TABLE OF CONTENTS

1.0 INTRODUCTION	1
2.0 PROJECT DESCRIPTION	3
3.0 DESIGN 3.1 MATERIALS 3.2 PROCESS 3.3 SPECIFICATIONS	5 5
4.0 CONSTRUCTION	7
5.0 EVALUATION 5.1 COSTS 5.2 SITE VISIT	9 9
6.0 CONCLUSIONS AND RECOMMENDATIONS 1 6.1 CONCLUSIONS 1 6.2 RECOMMENDATIONS 1	1
APPENDICES	
Appendix A: PROJECT SPECIFICATIONS	
Appendix B: CONCRETE SAMPLE & TEST DATA	
Appendix C: PHOTOGRAPHS	

LIST OF FIGURES

Figure 2.1	PROJECT LOCATION IN OREGON	3
Figure 4.1	PLACEMENT SEQUENCE	. 7
Figure C.1	CONCRETE BRIDGE DECK/ISOTROPIC REINFORCING	C-1
Figure C.2	CONCRETE BRIDGE DECK/ISOTROPIC REINFORCING	C-1

1.0 INTRODUCTION

Bridge decks in Oregon have traditionally been constructed using a "truss-bar" reinforcement configuration. Although these decks have generally performed satisfactorily in the past, there is a lot of room for error in the fabrication and installation of the reinforcing bars. In order to avoid this problem and to achieve a simpler, easier configuration for reinforcement, the Oregon Department of Transportation decided to construct a deck with isotropic reinforcing on the USBR Canal Bridge (Bridge No. 8345A).

The bridge deck was constructed using conventional materials (Class 4000 concrete and ASTM A615 Grade 60 reinforcing steel) with standard placing and curing practices. The materials were placed to provide uniform reinforcement both longitudinally and transversely along the bottom and top of deck, thereby giving an isotropically reinforced bridge deck.

Isotropic bridge deck reinforcing is being examined as a possible cost-saving alternative. Reduced material requirements and more constructible reinforcing placement are expected to reduce the cost of the initial construction. Long-term savings may result from a reduction in the severity of deck cracking and, consequently, a reduction in deck deterioration.

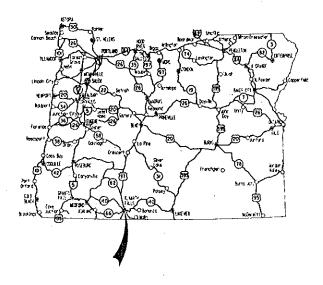
The objective of this project is to evaluate the isotropic reinforced bridge deck constructed on the USBR Canal Bridge. The evaluation will consist of monitoring the construction process, construction costs, maintenance costs, and the overall performance of the deck for a two-year period. This report will cover the construction process and costs.

2.0 PROJECT DESCRIPTION

2.1 PROJECT LOCATION AND CLIMATE

The project is located on the Dalles - California Highway (US HWY 97) at Mile Post 273.71, Klamath Falls, Oregon, in Klamath County, as shown in Figure 2.1 below.

The project is in the South Central climatic region, which is characterized by cold, dry, snowy winters and warm dry summers. The average daily temperature of the coldest month (January) is 29.6°F (-1.3°C). The average daily temperature of the warmest month (July) is 67.7°F (19.8°C). The area receives an average annual precipitation of 13.5 inches (34.3 cm).



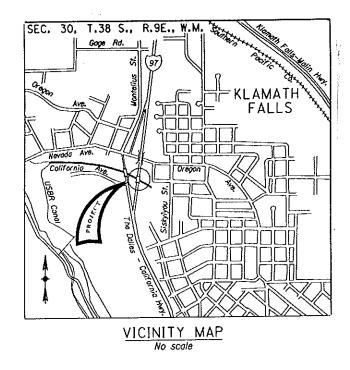


Figure 2.1 Project Location in Oregon

3.0 DESIGN

3.1 MATERIALS

The main construction materials for the isotropic reinforced bridge deck consists of concrete and reinforced steel. The reinforced steel is ASTM A615 Grade 60 or A706 which is normally specified for the typical bridge deck types found along the state highways in Oregon. There are no "truss bars" in this isotropic reinforced deck.

3.2 PROCESS

All the reinforced steel is straight #5. It is placed on 12-inch (300 mm) centers going both ways along the top and bottom faces of the bridge deck. The spacing is then reduced to 6-inch (150 mm) centers in the areas adjacent to the skewed bents and in the overhang areas to offer more support. In addition, there is a 3-foot (900 mm) wide closure poured down the center of the bridge where the spacing of the transverse steel is reduced to 6-inches (150 mm) on both the top and bottom faces. The top layer of the reinforced steel is epoxy coated in all areas.

The bridge deck is 8-inches (200 mm) thick, with 2½-inches (65 mm) of concrete cover provided for the top steel and 1¼-inches (30 mm) of concrete cover provided for the bottom steel. The concrete is class 4000. The cement content was increased by the contractor to ensure adequate strength at 7 days.

3.3 SPECIFICATIONS

The design specifications for this project were no different than the specifications which would have been used for a traditional deck design. The isotropic reinforced design also conforms with the current version of the LRFD specifications being developed by AASHTO.

4.0 CONSTRUCTION

4.1 CONSTRUCTION SUMMARY

Mocon Corp. removed the old deck using hydro-demolition and mechanical methods. One longitudinal construction joint exists 1' 6" (460 mm) east of the roadway centerline. This construction joint was necessitated by the staging required in order to maintain traffic on half the bridge while the other half was under construction. A transverse construction joint was formed at each bent. A minimum of three days was required between adjacent placements. Figure 4.1 shows the staging and sequence of the concrete placement. Although there were some problems encountered in removing the old deck, the new deck construction proceeded as expected.

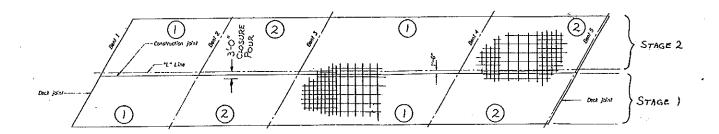


Figure 4.1 Placement Sequence

4.2 CONSTRUCTION OUTLINE

Start of Construction:

07-16-92

End of Construction:

12-31-92 (est.)

Contractor:

Mocon Corporation

ODOT Project Manager:

Richard Steyskal

ODOT Inspector:

Ken Paetz

Discussion Items

- 1. The contractor did not complete this project by the specified completion date. There was some delay caused by the need for the contractor to repair damage done to the bridge during the deck removal phase. Other delays occurred which were not related directly to the deck replacement part of this project (there was another structure involved in this project). No delays were related to the design or construction of the new deck.
- 2. The type and spacing of chairs to be used for the reinforcing steel was not adequately specified. The spacing and type of chairs used had to be clarified verbally.

5.0 EVALUATION

5.1 COSTS

The bid for replacing this deck was \$12.36/Square Foot (S.F.)(\$133.05/m²). Bridge deck replacement costs have not been tracked as a discrete item, so comparisons to historical data cannot be made directly. Based on historical data for the costs of materials, ODOT would have expected the isotropic deck for this bridge to cost \$11.10/S.F. (\$119.48/m²) and the "truss-bar" deck to cost \$13.30/S.F.(\$143.16/m²). The bid cost was about \$1.00/S.F. (\$10.76/m²) higher than expected, but still was \$1.00/S.F. (\$10.76/m²) lower than the historical bids for an equivalent "truss-bar" deck.

The discrepancy between the bids for this deck versus ODOT's estimate for this isotropic deck cannot be accounted for. The bid price for the Class 4000 concrete was \$245/C.Y. (\$320.43/m³) versus an ODOT estimate of \$350/C.Y. (\$457.76/m³). The bid price for the reinforcing steel was \$0.47/lb. (\$1.04/kg) versus an ODOT estimate of \$0.45/lb. (\$0.99/kg). The bid price for the epoxy coated reinforcing steel was \$0.64/lb. (\$1.41/kg) versus an ODOT estimate of \$0.65/lb. (\$1.43/kg). It is useful to remember that there was other work involved in this project (LMC overlay on another bridge).

5.2 SITE VISIT

The site was visited on November 20, 1992. This was at the close of construction, before traffic had been switched back onto the second stage of the deck replacement. This was done in order to get a good look at the deck before the traffic became an obstruction, and before the weather became worse (rain and/or snow). The purpose of the site visit was to view the finished product, and perform a baseline crack survey. The cracks will be monitored very closely during the evaluation period.

At the time of the site visit, there were very few visible cracks. The only cracks noted were single, very light cracks straight down the bent line. There was one crack at each bent, centered on the bent. These cracks are typical of slabs placed continuously over simple-span girders, and are not related to deck design. There are 3-inches (75 mm) of cover over the top steel instead of the $2\frac{1}{2}$ inches (65 mm) shown in the plans.

Kevin Groom, Mike Pulzone, and Ken Paetz were members of the inspection team. As part of the inspection the underside of the bridge was also inspected. The deck appears to have no serious defects which would have an effect on its long-term performance.

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 CONCLUSIONS

Isotropic reinforcing is easier to design, detail, fabricate, inspect, and install than the typical reinforcing used in bridge decks on the state highways in Oregon. The project inspector seemed very pleased with the overall concept, and thought it contributed directly to fewer problems in the construction of the deck.

This type of deck design should result in a consistently superior product when compared with the traditional "truss-bar" deck. Although there is a savings at the time of installation because of the lower initial cost, that is not the primary benefit ODOT expects to gain from this type of reinforcing. The primary benefit expected is a longer lasting, more durable bridge deck.

6.2 **RECOMMENDATIONS**

This bridge deck, and other ODOT bridge decks with isotropic reinforcing should be evaluated for several years, until a suitable performance history is developed. If cracks are detected, an attempt should be made to determine if they are the result of service loads, shrinkage, or construction practices.

APPENDIX A PROJECT SPECIFICATIONS

Project specifications relevant to the experimental features portion of this project, Concrete Bridge Deck With Isotropic Reinforcing, are partially discussed in the Special Provisions and Supplemental Standard Specifications For Highway Construction as follows (1):

SECTION 00530 - STEEL REINFORCEMENT FOR CONCRETE

Furnish and place steel reinforcement according to Section 00530 of the Standard Specifications supplemented and/or modified as follows:

<u>00530.80 Measurement</u> - Measurement of all reinforcement in the structure listed in 00530.82 will be on the lump sum basis.

<u>00530.82 Lump Sum Basis</u> - The estimated quantity of reinforcement to be paid for on the lump sum basis is as follows:

Quantity (lb.) Uncoated Coated

8345A

<u>Structure</u>

64,600 66,200

SECTION 00540 - CONCRETE BRIDGES

Furnish, place and finish concrete for bridges according to Section 00540 of the Standard Specifications supplemented and/or modified as follows:

<u>00540.15 Process Control</u> - In the Table under 00540.15(c)(2) listing required tests, change the Fineness Modules, Sand Equivalent, and Sieve Analysis testing frequency from "One per 5 Shifts" to "One per Shift".

00540,52(a) General requirements and Limits - Add the following:

All exposed concrete surfaces, except for roadways and sidewalks, shall receive a class 1 surface finish. Sandblast surfaces which have been cured with a

¹ Special Provisions and Supplemental Standard Specifications For Highway Construction 24V-72: U.S.B.R. CANAL (KLAMATH FALLS) BR. SEC. - THE DALLES - CALIFORNIA HIGHWAY, KLAMATH COUNTY. Oregon State Highway Division, Salem, OR, May 1992.

curing compound to remove the curing compound prior to receiving a Class 1 surface finish.

<u>00540.81 Lump Sum Basis</u> - The estimated quantity of concrete to be paid for on the lump sum basis is as follows:

<u>Structure</u>	<u>Class</u>	<u>Quantity</u> (Cu. Yds.)
8345A	4,000	410

APPENDIX B CONCRETE SAMPLE & TEST DATA

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ع.9د ـ	02		lbs i	REQ. REL. STR.	! A	CT. REL.	STR.	CYLIND	ER CURE	HRS OR
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K/Y_/		10 =		AB USE ONLY		-	00	CELU	4 16	PHP = (XX)
COOC	BN LA IEA	-		<u> </u>	<u></u>	DATE	DATA S	HEET RECEIVED		DERS RECEIVED
LABOR	RATORY REPORT						9-1	18-92		8.92
		AGE DAYS	STRENGTH PSI	DATE REPOR	RTED L	AB REM	AARKS:	INCLUDE MAX.	LOAD, AVG. DIAM	A. AREA, AND NG CYLINDERS.
CYL NO.	DATE OF BREAK	AGE DATS		9-23-9				Canada	Seat Last Last.	THE PERMIT
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Oregon Department of Transportation	04401 5 04	TA AND I A	DODATORY:	TECT DEDO	DT	LABORATO	ETZ E	<u> </u>
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CONCRETE FOR USE IN (LOCATION O	PLACEMENT)	nd W	DECK		BRIDGE NO		REQUIRED	28
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DESIGN: 192-08	402 400		101-4 1	NT CONTENT	SLUMP	IN. AIR CONTE	NT FIELD W/O	BATIO BY WT.
FIELD TEST RESULTS A 1924 #	MOISTURE CONTEN	75 14	15.7 -	chi	31/2	4.8	4 D.	34
708-350 111/23/4	. 4. 4. 5.	CONCRE	TE MIX PROPORTIONS	AS BATCHED		WATER	_ · ·	TER AT JOB SITE
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PRESTRESS STEAM HOUF	ļ	TEMP	REG. REL. STR.	ACT. REL.	STR.	CYLINDER STD	CURE DAYS FIE	HR\$ OR LDDAYS
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X MATERIALS - EUGENE CONTRACTOR	MOCON CC	RPORATION	えわひMT V		11.	1.00		
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A 1734-3573 (9.86) INSTER	OU GENERAL MOLEN	···∸ IRIGINAL TO MATER	IALS LABORATORY S	LEM, CANARY TO	PROJECKM	IGR, PINK RETAM	NED BY ORIGINA	TOR

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Oregon Department of Tra	ALCOPULION NOTED XAL	MPLE DAT	TA AND LAB	ORATORY	TEST REPO	RT	LABORATOR	1809, z	6 1992 E
HIGHWAY DIVISION	7 3. J. 512	AT 45071011	F	OR			92 1 .	180a .	
	DE DALLES CALFORN	ia highway	CONCRETE	CYLINDER	<u> </u>		DATA SHEET	*****	
PROJECT	CONTRACT NO:	C11208	7	12 5 - 32			C	7609	8 411
ļ	KLAMATH COU	41 ł			COUNTY		E. A. SUB JOS		5
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CONTRACTOR				, 13 St			FA PROJECT	🖍 🚺	BIO ITEM NO.
	MOCON C	ORP.			<u> </u>	•	NH-4	4-1 (35)	23
PROJECTMANAG			_		AGY, ORG. UNIT	ΩΤΥ	TEST NUMBER	VAR LAB CH	
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SUBMITTEDBY			0		AGYORG. UNIT		734x	50	0.
Eu	HARN E	27 GZ/2	SKAL		02-000		1312		
				SAMPLE DATA	4				
CONCRETE FOR	USE IN (LOCATION OR PLA	ACEMENT)				BRIDGE N	/	REQUIRED	6
	E#1-SA	DAME A	£2£4	, Deci		8345		O PSI	DAYS
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JEFF	ENSON S	11/5 ·	SHOW-	CONTR			WITNESSED	BY (SIGNATURE)	
REPRESENTED B	Y	SET NO.	// PATE	E CAST 18-97	DATE SHIPPEI	1-9	2.	D , (0.0	
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OFMENT	BRAND	TYPE 1	LAB OR MI	ILL ANALYSIS NO.	ADDITIVES:	BRAND	TERBUILD	MA	80
CEMENT:	CAUNCEUN	S 1-11	CON COR	TESOURCE NO. CEM	ENT CONTENT	SLUMP	AIR CONTE	T MAX W/C RATI	<u> </u>
MIX	LAB OR I.D. NO.	DESIGN STR	O 18 %	. / /	700 lbs/cu yd	2-5	-	x1 04	40_BY WT.
DESIGN:	TOTAL FIELD MOIS	C Z Z			ENT CONTENT	SLUMP	AIR CONTE	T FIELD W/C RA	TIO
FIELD TES	Τ	3-5	2011	16. 91bs/cu ft Z	06.5 lbs/cu yd	31/2	5.0	x 0,3	5BY WT.
RESULTS	111/270/7	94-4 <u>0-5</u>		TE MIX PROPORTION	S AS BATCHED			WATER	AT JOB SITE
Trives 352	CEMENT	FLYASH	1-1/2 - 3/4	AGG 1-344-47	4.710 lbs	9700	2 lbs WATER	7O gai	gal
	LOTCAM MOURS	MAX 1	EMP .	REQ. REL, STR.	ACT. REL	.STR.	CYLINDER	CURE t	HRS OR
PRESTRES: CONCRETE	5 }	HRS	۰		<u> </u>		STD	DAYS FIELD_	OR DAYS
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COX	en 147	GD41	= ///=		goin.	سر	7 /87	,,	
			L	AB USE ONLY E	ELOW	DATA CUE	ET RECEIVED	DATE CYLINDERS	RECEIVED
LABOR	ATORY REPORT				DATE		2-94		2-92
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CYŁ NO.	DATE OF BREAK	AGE DAYS	STRENGTH PSI	9 28-93	D LABRE	iiAiiko.	OBSERVED DEFECT	S FOR FAILING CT	LINDENO.
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X 1734-3573 (9-86	n instructio	IN: FORWARD O	RIGINAL TO MATER	IALS LABORATORY	SALEM, CANARY TO	O PROJECT	MGR, PINK RETAIN	NED BY ORIGINATO	R

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Oregon Department o		AMPLE DA		BORATORY	LEST REPOR	11	LABORATOR	YNO. NOV 1	9 1992C
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	U.S.B.R. CARAL IN F.	BRIOGE SECTION	OONOTIETE	4	<u> </u>		DATA SHEET	NO.	
PROJECT	THE DALLES CALL CONTRACT	ORNIA HIGHWAY	•	,	•		С	8845	9
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CONTRACTOR	R			til e service			FA PROJECT	NO.	BID ITEM NO.
	MOCON	CORP	•				WH-7	ر دی ا	<i>Z3</i>
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J. J. J.	1000 ST	12/12/1	al	ļ	D2-8033		34X	500) 1
4-12-51	HAIC SI	7				<u>.l</u>			
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STA	45 × 2, 5	PAN FO	2, DEC	TYPE OF SA		345A	SAMPLEDAY	PSI	DAYS
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•	5		841	11-7-9	2/1/-9	7-92			
NO. OF CYLS			TEST CON	CRETE CYLINDER OR					
1 フ	1 14	1. 21	9 >	حر ۽ اس 🗷	B DAYS F_	DAYS	 	DAYS H	DAYS
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CEMEN	1 =	ME T.T.	LA.V	#676	ADDITIVES:	HASTER	BUILDE	MBC-8	
	I LAB OR I.D. NO.	DESIGN STR	RENGTH AGGREGA	ATE SOURCE NO. CEM	ENT CONTENT	SLUMP	AIR CONTEN	T MAX W/C RATI	0
MIX DESIGI	N: 92-0940	2 400	20 18-	101-4 6	ibs/cu yd	3-4 IN	<u>ان</u>) _% <u> </u>	BY WT.
	TOTAL FIELD MO	ISTURE CONTEN	T% UNI	TWT CEM	ENT CONTENT	SLUMP	AIR CONTEN		
FIELDT	TS 1.1/2-3/4	3.0	2. FA Z.5 15	40.62 11 6	86.2Z10s/cu yd	4/4 IN	6.2	<u> ~ ~ 3</u>	BY WT.
L. <u>— — — — — — — — — — — — — — — — — — —</u>	_60_								•
4 OVES	CEMENT.	I FLYASH	CONGRE (1-1/2 - 3/4	TE MIX PROPORTIONS	S AS BATCHED	م دست	WATER		AT JOB SITE
ives 336	CEMENT 5640		CONCRE 1-1/2 - 3/4	I AGG	640. SAN	1528 lb	Les	<u>O_931</u> S	gal
PRESTR	RESS STEAM HOURS		1-1/2 - 3/4 TEMP	AGG 1-8/4-4.5	GG I SANL	1528 lb	CYLINDER C	O_galS	991
-336	RESS STEAM HOURS	lbs	lbs 1-1/2 · 3/4	I AGG	640. SAN	1520 lb	Les	<u>O_931</u> S	991
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PRESTR	RESS STEAM HOURS ETE: ARKS: ARKS:	HAS MAX	1-1/2 - 3/4 TEMP	REO. REL. STR.	640. SAN	1520 lb	CYLINDER C	O_galS	991
PRESTR	RESS STEAM HOURS ETE:	HRS HAX	1-1/2 - 3/4 TEMP	REO. REL. STR.	640. SAN	1520 lb	CYLINDER C	O_galS	991
PRESTR	RESS STEAM HOURS ETE: ARKS: ARKS:	HRS HAX	1-1/2 - 3/4 TEMP	REO. REL. STR.	640. SAN	1520 lb	CYLINDER C	O_galS	991
PRESTR	RESS STEAM HOURS ETE:	HRS HAX	1-1/2 - 3/4 TEMP	REO. REL. STR.	640. SAN	1520 lb	CYLINDER C	O_galS	991
PRESTR	RESS STEAM HOURS ETE:	HRS HAX	1-1/2 - 3/4 TEMP	REO. REL. STR.	640. SAN	1520 lb	CYLINDER C	O_galS	991
PRESTR	RESS STEAM HOURS ETE:	HRS HAX	TEMP .	REQ. REL. STR. 100	ACT. REL.	1520 lb	CYLINDER C	O_galS	991
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Y ICI	LARD STE	C/SKA	2	<u> </u>	2-8033		34X	500	
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м	X LAB OR I.D. NO.	DESIGN STR	ENGTH AGGREGA	TE SOURCE NO. CEMEN		LUMP 3-4	AIR CONTENT	MAX W/C RATIO	S_BY WT.
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C	12.5	28					NOV 1	g 1002	
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	DISTRIBUTION XFILES FHWA	=		<u>,</u> '\$	OTHER (Descr	106)		[_]	
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Oregon Départment of Transports	san san	IPLE DAT	A AND LAE	ORAT	ORY TE	ST REPOF	₹T `	LABOR	RATORY NO	. NOV 2	0 199Z -₽
HIGHWAY DIVISION		•	CONCRETE	OR					9213	951	- <i>U</i>
PROJECT			.) BRIDGE SECTION					į.	SHEET NO.	00150	
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WAY		LAMATH C			ÇOL	INTY		E. A. S	OB JOB	1208	
CONTRACTOR								FAPR	OJECT NO.	(50	BID ITEM NO.
K	ADCOM C	erP.				• ;	-	NI	4-4-	7(35)	<i>23</i>
PROJECT MANAGER					AG	Y.ORG. UNIT	QTY	TEST NUM	BER VAR	CAB CH	
FICH	AND ST	acts.	se		AG	1-8033 YORG: UNIT	5	719	7	1 763	-
SUBMITTED BY	10 50	MISE	sl_		0.	2-8033		734	18	500)
4 CONTRA	100			SAMPLI	E DATA	Swaller Hall			,		
CONCRETE FOR USE II	N (LOCATION OR PLA	CEMENT)				1	BRIDGE		NGTH REQU		A
STAGE	£2 5/	MAI	- OBTA			<u> </u>	<u>834</u>	1579 5	LEO BY (PR	PSI	DAYS
CONCRETE SUPPLIER			<u></u>	. 1	TYPE OF SAMP	LE RECORD		SAMI	AS TO	100	2
LEFFER	BOA ST	1016 Y	(13) AN - PM	E CAST	CONTROL	DATE SHIPPED		WITN	ESSED BY (S	SIGNATURE	
REPRESENTED BY	5	SET NO.	5/	1-4/-	-82	11-5-	-	-			
NO. OF CYLS.		<u> </u>	TEST CONC	RETE CYLI	INDER OR BEA	M IN DAYS		<u>.</u>	*************************************		
1 7	18 14 DAY	1, 28	B DAYS D Z	8 DAYS	EZE	3_DAYS F		_DAYS G		DAYS H	DAY
ADAYS	BRAND	TYPE 77		ILL ANALY		DDITIVES:	BRAND	BIZILIS	WLAR	TYPE A	UR.
CEMENT:	ALAVERA		L.A. Con	TE SOURCE	2 RO	CONTENT	SLUMP	LAIR	ONTENT	MAX W/C RATI	~ <i>~~</i>
MIX DESIGN:	LAB OR I.D. NO.	DESIGN STRI	NOTH AGGREGA	101-		lbs/cu yd	<u>3</u> ·	4in.	50	0.8	<u> </u>
	TOTAL FIELD MOIS	TUBE CONTENT	'% TUNI	TWT	CEMENT	CONTENT	SLUMP	// Air	CONTENT	FIELD W/C RA	
FIELD TEST RESULTS	1-1/2-3/4	3.0		3,25.10		.99 _{lbs/cu yd}	47	少 in. 5	<u>۰۵</u> _%	<u> 0,3</u>	<u> </u>
11VE 263	CEMENT	FLYASH	CONCRE 1-1/2 - 3/4	TE MIX PRO AGG	PORTIONS AS 1-2/4 - 4 AGG	BATCHED SANS	3	O lbs WAT	165	WATER	AT JOB SITE
<u>(543)</u>	5650	<u>* </u>	1bs	REQ. REL.	<u> 14,4</u>	ACT. REL.		OYL	NDER CURE	931	HR OF
PRESTRESS CONCRETE:	STEAM HOURS	HRS HRS	e emp	neu. neu.	. 5111.			STD.		Oprio Care	- \
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0000	r our	/ &/	<u> </u>	- N	/ LOTO	ZWA	<u>خ</u> ر_	Pus	PER		77 0
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LABORATO	RY REPORT			T		1 -				VG. DIAM., ARE	
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	-18	14 28	<u> </u>	11 -4	<u> </u>						
	<u>~ Z.</u> ~ Z.	28		<u> </u>							
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HIGHWAY DIVI	GHWAY DIVISION FOR CONCRETE CYLINDERS								921.4074				
PROJECT				D	ATA SHEET N		4 F D						
L		COUN				c 88457							
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CONTRACTO		.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		F	FA PROJECT NO. BID ITEM NO.								
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	•			SAMPLE C	DATA								
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STA	GE#2 5	PARK	3 De	CK		Š	<u> 334</u>	574_	. 4000 PSI DAYS				
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REPRESENTE	ENSON STA	I SET NO	101-0110	ATE CAST	ONTROL	RECORD		- 1	TITNESSED BY	ISIGNATUR	(Z		
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10.01 0723			TEST CO	NCRETE CYLINDS	R OR BEAM I	N DAYS							
L 7	DAYS B 14-DA	vs c 2	9_days d_2	B DAYS E	28	DAYS F		_DAYS G	I	.DAYS H		_DAYS	
	BRAND	TYPE		MILL ANALYSIS	yo.	<u>'</u>	BRAND				BUR		
CEMEN	TE COLALBRA	s \mathcal{I} - \mathcal{I}	L.A. CER	r# 674	?	ITIVES:	1403i	ZNB	MOOR	MBC	2-80		
MIX	LAB OR I.D. NO.	DESIGN ST	RENGTH AGGREG	GATE SOURCE NO.	CEMENT CO	NTENT	SLUMP	/ ^	IR CONTENT	MAX W/C	-/-		
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FIELD T RESUL	EST	1430		46,020 tt	7/2.	10		4 ^	5.0%	1 ~	23	SY WT.	
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336	254 CEMENT.	FLYASH	1-1/2 - 3	14 AGG 124	4-4 AGG 1 <u>1 4 6</u> 4	Obs SANC	528	3 lbs	VATER 160	gal	TER AT JUBS	gal	
PRESTR		MAX	TEMP	REO. REL. STR		ACT. REL.	STR.	C	YLINDER CUF	IE		HRS OR	
CONCRE	ETE:	HRS	•	1-0		!		s	ro	_DAYS FI	Fro 7 4	DAYS	
FIELD REMA	ARKS: ANB. L	An To	34P	45 F						<u> </u>	CIX	L	
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	morling TH	1/25	3P 7	700/2					> 0	NUV	23 19	92	
	or some office	1 -	AP - 7	2500					² ROJI	:() A	ONCHER - C	REW	
	ONCER SUS	161	<u> </u>	<u> </u>	is 1	1110 4	1	0		APM\\	SET WIN	THE	
) BICKET	EU	UND ,	I LID	est fle	<u> </u>		<u> </u>		
<u> </u>				LAB USE ONI	Y BELOW		ATA SHE	EET RECE	IVED DA	TE CYLINO	ERS RECEIVE	-	
LABO	RATORY REPORT				11-9-				92 11-9-92				
CYL NO.	DATE OF BREAK	AGE DAYS	STRENGTH PSI	DATE REF	ORTED	LAB REMA	ARKS:	INCLUDE OBSERVE	MAX. LOAD, A	VG. DIAM. OR FAILING	AREA, AND CYLINDERS.		
Α	11-12_	7	4240	11-16	2-12								
B	11-19	184	<u>4770</u>	11-20	92								
C	12-3	28 28										\dashv	
E	12-2	28		· · · · · ·					<u>.</u>				
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н	1	AVE, STR:		28 DAYS			-CT T\1	, O.E.	***		preu 3	l	
()		AVE.SIN:	· · · · · · · · · · · · · · · · · · ·	LODATO	□ NON		EST TY AL□S		ICAL		RESULT		
\	DISTRIBUTION XILES OTHER (Describe) FAIL												
2	KSL RICHARD STEYSKAL												
PROJECT MANAGER REGION GEOLOGIST MATERIALS - PORTLAND MATERIALS - EUGENE CONTRACTOR MOCON CORPORATION								44					
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JEFFERSON STATE READY MIX

H .	SAMPLE DATA AND LABORATORY TEST REPORT FOR CONCRETE CYLINDERS									LABORATORY NO.			
PROJECT			C 88450										
HIGHWAY			COUNTY	E. A. SUB JOB //208									
CONTRACTO		1/10	\mathcal{Q}						FA PROJEC		(35)	BID ITEM NO.	
PROJECT MA	MOCOM HAND STE					ST NUMBER VAR LAB CHARGE							
SUBMITTED			02-803 AGY,-ORG, UNIT	3				W W W W					
1/10	HARD ST		02 803	3									
				SAMP	LE DATA	A							
CONCRETE FOR USE IN (LOCATION OR PLACEMENT) BRIE STOCK								STRENGTH REQUIRED 4.000 PSI 28 DAYS					
CONCRETES		int 7	<u> Pour</u>	_	TYPE OF SA				SAMPLED BY (PRINT NAME)				
REPRESENT	RENEON ST	NIE SETN	0. CT-DM-	ATE CAST	CONTR	ROL RECORD DATE SHIPPED			MITNESSED BY (SIGNATURE)				
NO. OF CYLS	5_	·	9	11-1.	3-95	2 //-/	16-9	2_					
. 7	1 14	1 2	S DAYS D	フロ	1 >	BEAM IN DAYS			! _				
A	BRAND	TYPE		MILL ANAL		DAYS F_	BRAND				(PE MB	VR.	
CEME	VT: ALAVER	·	L.A.CO	RTH (276	ADDITIVES:	SLUMP	316/		57C A	JBC-2		
MIX DESIG		1	0 18	-101	46	50 lbs/cu y	1	<u>4</u> in.	6.C)_% 	0.40	<mark>2ву wт</mark> .	
FIELD FIELD	TOTAL FIELD MO		1	INIT WT 145,1 <i>0</i> 6,	i	NT CONTENT 29.035/cu y	SLUMP	3//	AIR CONTE	NT FI	ELDW/CRAT		
MBC-80			CONC		ADADTIANO	AC DATCHED			WATER .	— 1°° —		T JOB SITE	
<u> 34</u>	CEMENT SCHOOL	lbs MAX	TEMP	REQ. RE		SA SA SA SA SA SA SA SA SA SA	952 952	<u> Ibs</u>	CYLINDER	CUBE	9al	gel	
PREST	RESS TENTONIO	HRS	(STD		AYS FIELD_	HRS OR DAYS	
FIELD REM	ARKS: AMB.	AIR -	TEASP.		F	•					*******		
	CONCRE	·	EXP.	66	Z								
	4 - Cool	en T	EMP.	72°	F								
<u>Ou</u>	f - C00	Cen 1	67H.	79%	<u> </u>								
LAB USE ONLY BELOW DATE DATA SHEET RE									CEIVED	DATE C	YLINDERS R	ECEIVED	
	LABORATORY REPORT							INCLUI	DE MAX. LO	D. AVG	DIAM., AREA	A: AND	
CYL NO.	DATE OF BREAK	AGE DAYS	STRENGTH PSI	DAT	E REPORTE	D LABRE	MARKS:	OBSER	VED DEFECT	S FOR F	DIAM., AREA	NDERS.	
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C D _f								•		-			
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Н		AVE STO		70 00	/e								
\bigcirc	AVE. STR: 28 DAYS NON-STATISTIC OF THE PROPERTY OF THE PROPERT											ESULT IPASS IFAIL	
Ü	FHWA CSL PROJECT MANAGER REGION GEOLOGIST MATERIALS - PORTLAND MATERIALS - EUGENE CONTRACTOR												

ENGINEER OF MATERIALS

APPENDIX C PHOTOGRAPHS



Figure C.1 Concrete Bridge Deck/Isotropic Reinforcing

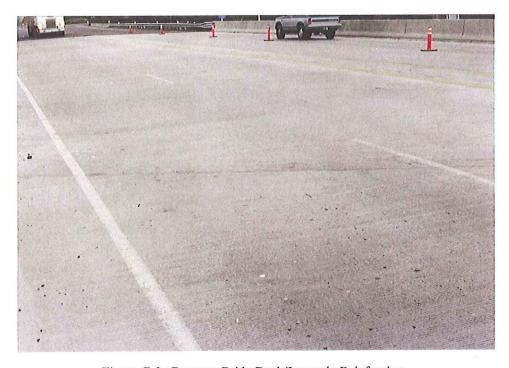


Figure C.2 Concrete Bride Deck/Isotropic Reinforcing